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A MIOCENE SLOTH FROM SOUTHERN CHILE

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The purpose of the present note is to describe a specimen that represents one of the most southern of known fossil mammals, one of the few Tertiary mammals known from Chile, a new species of a relatively rare and important genus and a fairly exact time marker for an imperfectly known and hitherto uncertainly dated sequence of Tertiary strata. I am indebted to Mr. Junius Bird for the opportunity to describe his discovery and for field data concerning it, to Mr. Albert Thomson for preparation of the specimen, and to Mr. John C. Germann for the accompanying drawing.

TAXONOMY

ORDER **EDENTATA** CUVIER, 1798

SUBORDER **XENARTHRA** GILL, 1884

FAMILY **MYLODONTIDAE** AMEGHINO, 1889

Subfamily **Mylodontinae** Gill, 1872

GENUS **NEMATHERIUM** AMEGHINO, 1887

Nematherium birdi,[1] new species

TYPE.—Amer. Mus. No. 32652, imperfect skull with upper dentition, lacking the first two teeth on the left side.

HORIZON AND LOCALITY.—Isolated exposure of the Palomares or Santa Cruz formation, evidently of Santacrucian age (early Miocene?), on the east side of Laguna Blanca, Department of Magallanes, southern Chile.

DIAGNOSIS.—A relatively large *Nematherium*, intermediate in size between *N. auca* and *N. profundatum*. First upper tooth well developed, reniform. Second to fourth teeth subequal; second and third rounded, vaguely triangular, strongly oblique; fourth obliquely quadrate. Last upper tooth elongate transversely. Palate probably narrow throughout.

AFFINITIES AND CHARACTERS

It is evident that this specimen represents an early mylodontid ground sloth comparable in degree of evolution with the rare mylodontids from the Santa Cruz formation of Argentine Patagonia, to the north of this locality.

Ameghino (collected works or references in Scott, 1904, plus Ameghino, 1904, cited below) placed the Santa Cruz mylodontids in five genera: *Nematherium, Ammotherium, Lymodon, Analcitherium, and Scelidotheriops*. The last was published at about the same time as Scott's revision (1904) of these forms and so is not mentioned in it. Of the other four, Scott considered *Ammotherium* and *Lymodon* as synonyms of *Nematherium* and suggested that *Analcitherium* might be a juvenile *Nematherium* but tentatively retained it on the basis of its less divergent tooth rows, more parallel sides of rostrum, and shorter preorbital region. Because of lateral crushing and loss of the tip of the rostrum, our specimen does not show the supposed generic distinctions. The teeth are, however, somewhat more like specimens placed by Scott in *Nematherium* and this fact, together

[1] For Junius Bird, who found the specimen.

with the doubts as to the status of *Analcitherium*, warrants reference to *Nematherium* as between these two. *Scelidotheriops* was based on one mandibular fragment with a single tooth and two alveoli. It was not figured and the description makes no direct comparisons with any contemporaneous genus. The validity and nature of *Scelidotheriops* thus are doubtful and must remain so until the necessary comparisons are published or better specimens are found. Direct comparison with our specimen, and with some other pertinent types, is impossible on the basis of the known material.

Possible pre-Santacrucian mylodontids are represented only by isolated teeth, as far as I know, quite different from those and does not further enter into the present inquiry. The remaining nine species recognized by Ameghino were reduced by Scott to five: *Analcitherium antarcticum*, *Nematherium angulatum* (all of the four species referred to *Nematherium* by Ameghino and by Mercerat), *N. auca* (Ameghino's two species of *Lymodon*), *N. profundatum* (two of Ameghino's species of *Ammotherium*), and *N. declivum* (Ameghino's third species of *Ammotherium*). The variation is such that even the species recognized by Scott, essentially Ameghino's genera, are hardly distinguishable when all the known specimens are compared and yet show great variation in minor and probably individual characters. They are thus poorly defined and of uncer-

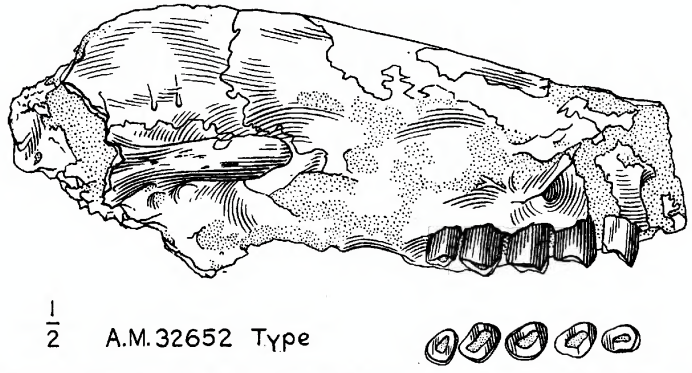

Fig. 1.—*Nematherium birdi*, new species. Type, Amer. Mus. No. 32652, imperfect skull with upper dentition. Right lateral view of skull and crown view of teeth of right side. One-half natural size.

of the present specimen and only doubtfully related. The post-Santacrucian form nearest in time and in relationships is *Neonematherium*, based on a single specimen described without illustration by Ameghino (1904) and illustrated without description by Rovereto (1914). It is definitely more advanced than our fossil and certainly not congeneric.

Ameghino described ten species of Santa Cruz mylodontids (almost every identifiable specimen becoming a specific type) and Mercerat described one, *Nematherium lavagnanum*, which Ameghino considered (correctly, in Scott's opinion and in mine) as a synonym of his *N. longirostre*. *Scelidotheriops avunculus* is not well comparable tain validity and limits, as Scott recognized. As with many other Santa Cruz species, proper definition and revision can only be made when good series of specimens of limited and exactly known horizons and localities become available.

The forms of the teeth of the present specimen are distinctly outside the range of those previously described among Santa Cruz mylodontids, so that there is considerable probability that it does represent a new species, whatever may be the correct synonymy of those previously described. In size the teeth fall between *N. auca*, the largest supposed species, and *N. profundatum*, but this has no clear taxonomic significance since all previously de-

scribed species, with the possible exception of *N. declivum*, show no greater differences in size than often occur in a single species.

Instead of the cylindrical to subtriangular form seen in all the specimens referred by Scott to *Nematherium*, the first upper tooth is reniform in section, elongate anteroposteriorly, convex on outer, anterior, and posterior faces and concave on the inner face. This one tooth is somewhat suggestive of *Analcitherium antarcticum*, although the rest of the dentition is more as in *Nematherium*. Although subtriangular, the second and third teeth are more oval and more elongate and oblique in section than in previously described species. The fourth tooth is not triangular but obliquely quadrate in section, a striking and probably significant distinction from all previously described specimens. This character is somewhat approached only in the dentition referred by Ameghino to *Ammotherium profundatum* and regarded by Scott as possibly representing an unnamed species (figured by Scott 1904, pl. LXII, fig. 5). The last upper tooth is also strikingly distinctive in being transverse, i.e., wider than long in section, while in all previously known species of *Nematherium* it is elongate anteroposteriorly.

Crushing and decay have obscured the palatal characters, but from what remains it is possible that the palate was narrower throughout than in *Analcitherium* and narrower anteriorly than in specimens previously referred to *Nematherium*. Although much of the skull is present, it reveals no characters definitely distinctive from contemporaneous mylodontids and adds nothing to knowledge of structure as already described by Scott.

Differences of this specimen from other mylodontids of like age do not appear to suggest special relationships to any one later genus. Indeed I doubt whether the attempts made to distinguish such phyletic relationships among the scanty remains of Santa Cruz mylodontids have any objective value. These early mylodontids only ring changes within a limited genetic repertory and do not seem yet to have split into recognizably distinct lines within the family. In a general way they are all, as a group, structurally ancestral to all the later mylodontids.

MEASUREMENTS

Measurements of teeth of such irregular form and oblique orientation are difficult and have a large personal factor. As nearly as possible the following measurements of single teeth are in a plane transverse to the long (more or less vertical) axis of the tooth, the length between lines tangential to the tooth and at right angles to the vertical middle plane of the skull and the width between similar tangents parallel to that plane. Measurements are in millimeters.

Total length of upper dentition (somewhat altered by crushing)	ca. 50
First upper tooth, length	8.8
" " " width	6.2
Second " " length	9.9
" " " width	8.4
Third " " length	9.8
" " " width	9.2
Fourth " " length	9.8
" " " width	9.3
Fifth " " length	7.5
" " " width	8.5

OCCURRENCE AND AGE

This specimen was found in January, 1936, by Mr. Junius Bird while making an archaeological exploration for this Museum. The locality is on the mainland of southern Chile, in the Department of Magallanes, in about Long. 71° 61′ west, Lat. 52° 26′ south, about 80 kilometers north and slightly west of the town of Magallanes (Punta Arenas) and about 50 kilometers south of the Chilean-Argentine boundary (here running east-west). The exact spot is east of Laguna Blanca,[1] in Cañadón la Leona, a small watercourse flowing into the lake basin from the east and slightly south of the middle of the lake. It lies less than a kilometer (about five minutes' walk) east of the trail along this side of the lake and between that trail and the well-marked Pleistocene lake terraces that bound the lake basin. These indications permit precise localization on the map published by Caldenius, 1932, Pl. XII, and also on the Tierra del Fuego sheet of the International Millionth Map (Amer. Geog. Soc., 1930) where, however, the cañadón is marked "Cllo. [i.e., Chorrillo] de Las Lomas," either in error or on some authority contrary to the local usage. By coincidence a photograph published by Guiñazú (1940, p. 23, upper figure) shows not only the locality but also the precise block of rock from which the fossil came (the right of the two blocks most prominent in the left half of his picture) as well as a rock shelter (right half of photograph) which contained artifacts and attracted Mr. Bird's attention to this spot.[2] There is here a small exposure of the local bedrock, a gray tuff, which elsewhere in this region is hidden by glacial and other relatively recent deposits. The fossil was in a block of this tuff that had fallen from an overhanging ledge immediately above.

From the fossil, itself, the rock in question can be confidently designated as Santacrucian in age, hence probably Lower Miocene (see Simpson, 1940). The genus has never been reported from beds of any other age and while this find belongs to a new species, it is not evidently more advanced or more primitive than species found in the typical Santa Cruz of Argentine Patagonia. The only possibly close relatives from earlier beds are the octodontheres, quite distinctive and probably not directly ancestral, while *Neonematherium* from the somewhat later Friasian is definitely more advanced in structure. Santacrucian time probably was of considerable duration and rocks of this age may be expected to have distinguishable successive faunules, but lack of modern, careful field data has prevented the recognition of these even in the richly fossiliferous and thick type Santa Cruz and there is no basis for more exact placing of this isolated find. The fact that this casual discovery is of a new species of a genus rare in the rich fossil beds farther north may reflect some small difference of age, facies, or both.

Ameghino (1906, Fig. 57) showed the Santa Cruz beds as extending into Chile in this region, but not as far as Laguna Blanca. He did not, to my knowledge, record any Santacrucian fossils from Chile or state the nature of his evidence. Hemmer (1935) recorded the presence of *Astrapotherium magnum* (identified by Dr. C. L. Gazin, Washington) in what he calls the Palomares beds at Los Cruceros on the southern margin of the Laguna del Toro. This locality is some 38 kilometers almost due south (slightly west) of the locality of the fossil described in this paper and is approximately in latitude 52° 46′ south, about twenty minutes of latitude farther south than our specimen. *Astrapotherium magnum* is a Santacrucian species[3] and Hemmer therefore correlates his Palo-

[1] Many different lakes have this name in southern South America. This is not to be confused with the Friasian fossil locality, Laguna Blanca, in extreme southwestern Chubut Territory, Argentina.

[2] In view of the confused reports on the antiquity of man in South America, it may be well to emphasize that the artifacts are many millions of years younger than this fossil and that their proximity is pure coincidence.

[3] Hemmer quotes Gazin as saying that it is also Friasian, but the Friasian materials were not definitely referable to that species and have subsequently been placed in an exclusively Friasian species, *A. hesperinum* Cabrera, 1940. The genus ranges from Coluehuapian to Friasian, inclusive, a considerable span both earlier and later than Santacrucian. Hemmer's specimens are very fragmentary and the specific reference and therefore also the stratigraphic correlation are presumably uncertain.

mares beds with the Santa Cruz formation of adjacent Argentina. There is considerable probability that *Nematherium birdi* is from the same beds, although the isolated exposures have not been and probably cannot be correlated stratigraphically, and it should be recorded as a second Palomares species if the distinction between Palomares and Santa Cruz merits retention. As far as I know, Hemmer's is the only previous record of a mammal of comparable age from Chile and is also the most southern of all known Tertiary mammals.[1]

Guiñazú (1940) noted the presence of tuffs north, east, and west of Laguna Blanca, including the exposure where *Nematherium birdi* was found, as previously mentioned. He called these "formacion Santacruciana," presumably on lithologic grounds since he mentioned no fossils. The present discovery confirms and strengthens both Hemmer's and Guiñazú's correlations.

The occurrence of a sloth at this high latitude, where the climate is now bitterly cold, is a striking fact. Recent tree sloths are strictly tropical, but there is evidence that the ground sloths tolerated temperate, even cold temperate, climates. In North America *Mylodon*, a descendant of *Nematherium*, ranged to at least 48° north during the Pleistocene and at the same time, as well as probably into the geological Recent epoch, other descendants or allies ranged about as far south as the locality of *Nematherium birdi*. The famous cave at Ultima Esperanza is only about one degree farther north. It is also significant that one endentate (*Zaëdyus*, the pichy armadillo) still ranges into the cold climate of southern Patagonia. Even such relatively poikilothermous mammals as the Xenarthra may thus be inconclusive climatic markers. Some of the peculiarities of the Patagonian fossil record, such as the absence of tree sloths and the rarity and late, brief appearance of primates and anteaters, might be explicable if the climate of Patagonia had been continously more inclement than that of more equatorial regions where the main evolution of some South American animals probably occurred. It is, however, possible and it is congruent with the inconclusive evidence of the present discovery that the Patagonian climate may have been relatively mild in Santacrucian time, without being tropical. Thus primates and anteaters occurred in these lower latitudes only during or about that time, as far as now known, and Berry concludes that floras of approximately Santacrucian age and extending to about 51° south indicate more or less warm temperate conditions, warmer than at present in the same latitudes.

[1] Feruglio (1938) mentions the occurrence of presumably Santacrucian exposures farther south, in Tierra del Fuego, to about latitude 52½° south, but I have seen no record of mammals found in these exposures.

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